Software Requirements Specification

for

Twitter Sentiment Analyzer

Version 1.0 approved

Prepared by Saad Teeti, Prabhav Arora, Khalid El Essawi

New York University Abu Dhabi

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Revision History

Name	Date	Reason For Changes	Version

Khalid Essawi	November 7, 2020	Changes in the Requirements Gathering Report Providing more details on how requirements gathering and elicitation was conducted and the result analyzed.	2.0

1. Introduction

1.1 Purpose

- The product discussed in this SRS is a Twitter Sentiment Analyzer.

Product Scope covered by SRS:

- This SRS will cover all of the functionalities and scope of the product. The SRS will describe most of the system. The parts of the product that are not covered by the SRS are in-depth explanations of Python Libraries and the complex API functionalities required to connect to Twitter servers.

1.2 Document Conventions

No special conventions have been used in this document

1.3 Intended Audience and Reading Suggestions

The SRS is primarily intended for developers, project managers, and customers. The SRS contains the detailed functionalities, user analysis, product scope, etc. and such topics which are of primary concern to the aforementioned three parties. The SRS will help provide developers an outline for the project, it will give project managers a vision of the final product, and it will help customers who purchase/use the product, understand exactly what functionalities they are getting with our product. The SRS can also be used by marketing staff to identify product functionalities and promote them as such. Though it is recommended the SRS is read in the way that it is presented, certain parts of the SRS are more important than others for certain stakeholders.

- Developers and project managers should focus on sections 3,4,5
- Customers should focus on sections 4,5
- Marketing staff should focus on sections 2,4,5

1.4 Product Scope

Brief Description of Product: Our product aims to use Natural Language Processing to extract the sentiment of tweets on Twitter. Our product receives a keyword as an input (for example: “Lionel Messi”) and returns the sentiment of the latest tweets on that keyword.

Benefits, Objectives, Goals:

- **Evaluate Product Release/ Increase Product Quality:**
  - Businesses need to know how the public feels about the new products they release. Analysing sentiment can lead to finding changes that will make the product better suit customer needs
- **Identify new business trends and opportunities**
  - Since our product returns the sentiment of tweets based on a certain keyword, businesses can enter industry-relevant keywords and observe how society feels. For example, a car manufacturer may search "fuel engine" and "diesel engine" and design the car based on what society likes better.
- **Enhanced Customer Service:**
  - Constant monitoring of sentiments on social media can help businesses be better in sync with customer feedback. Customers will feel like they are being heard
- **Crisis Management:**
  - Constant monitoring of sentiments on social media can help detect signs of extreme dissatisfaction with products and help avert possible sales disasters
- **More accurate Market Predictions:**
  - Change in sentiments on social media have been shown to be correlated with changes in capital market security prices. Can help asset management companies make better decisions and more profitable investments
- **Competitor Tracking/Analysis**
  - Businesses need to know how their products are performing versus their competitor's products. Sentiment analysis can help gauge how customers feel towards competitor products.

2. Overall Description

2.1 Product Perspective

The product being discussed in this SRS is being made from scratch and it is not a follow-on member of a product family, a replacement for certain existing systems, or a new, self-contained product.

2.2 Product Functions

1. Use NLP model to analyse Twitter datasets
2. Allow user to enter keyword/s
3. Use APIs to scrape data from Twitter in real time
4. Return sentiment scores of keyword/s user has entered

2.3 User Classes and Characteristics

User Class 1 - Corporates and Businesses:

- Our product can help corporations in 3 ways.

  Way 1: Product Development:
  - These corporates may be looking for trending features or product specifications that can increase the sales of their product. They will use our product to enter relevant keywords and observe society sentiment.
  - Example: A soda manufacturer is looking to make a new drink. He could enter flavors as keywords (“Cola”, “Orange”, “Apple”, “Raspberry”) to see what flavor the public is liking the most

  Way 2: Product Feedback
  - Corporates can enter their product names as keywords and see how the public is responding to the product.
  - Example: Apple released the Iphone12. They can enter “IPhone 12” as keyword and observe how public feels

  Way 3: Customer Feedback
  - Corporates can enter their brand name as a keyword and see how the public is responding to the company itself.
  - Example: Mercedes wants to get customer feedback. We can enter “Mercedes” as a keyword and observe how the public feels about the brand itself.

User Class 2 - Economic Researchers

- Our product can help economic researchers observe and track new economy trends. For example they can type “gold” or “oil” and observe the market sentiment

User Class 3 - Home Users

- People at home may wish to use our product for help in stock analysis, research purposes, or even just personal interest.

2.4 Operating Environment

The system will operate on Python.

2.5 Design and Implementation Constraints

1. **Database availability**
   - Currently we are using the Niek Sanders database which has 5000 labelled tweets as our training set. Though 5000 data points is a good starting point for our NLP model to learn, our model would be much more accurate if we had a training set with more data points. We could not find any other dataset (for free) which had more data points than the Niek Sanders one

2. **Real Time Twitter API Limitation**
   - Twitter limits users to 180 tweet requests per 15 minutes. This means that a user can not do more than one keyword search each 15 minutes.
   - Also when we are loading our 5000 data points in our training set it will take us roughly 10+ hours to pull these tweets

3. **Data Quality:**
   - Our software will pull the latest 100 tweets on the keyword the user has entered. These 100 tweets may be spam and may not be a good indication of society's views and sentiments.

2.6 User Documentation

We will provide a user manual which will teach the user how to use our software.

3. External Interface Requirements

3.1 User Interfaces

The program is basically a combination of machine learning and natural language processing algorithm where there is not much user interface. The user/ customer will give the program a key word or a topic of interest where he wants to find sentiment for, and then we run the program where the algorithm would do the work. All the user has to do is just enter a topic, for example "Liverpool" and the algorithm will go through a recent set of tweets, and then produce a sentiment score for either about the topic, or the account. The user will get emailed a detailed report regarding the sentiment score.

3.2 Hardware and Software Interfaces

There is no hardware involvement in our program, as our program is going to be software based. However, when it comes to software, we will be using both concepts of machine learning and natural language processing to design the base and the application of the program. For the coding aspect, we will be using python language for programming. The data will be taken directly from twitter after requesting for

authorization through their developer website. The software will import data sets from Niek Sanders' Corpus software, this data set will be our training data set. The software at the beginning will prepare the test set, the training set, pre-processing tweets in the data set, classify them, using Naive Bayes Classification, and testing the models. We will be using the libraries twitter, nltk, re, csv, time, and json

3.3 Communications Interfaces

The user/customer will contact us for the sentiment analysis on the topic they require. The software will reach out to twitter server to import the data set after getting the authentication for it, last 100-200 tweets from twitter on this topic, the program will classify the tweets based on emotions, and will come up with sentiment score, then the sentiment score will be given to the customer/user. The score will be either displayed on the platform, or a detailed report will be sent to the user/customer.

4. System Features

In this section we will be talking about the functionality of the program using use case scenarios, and how we are organizing our program.

4.1 Customer Enters a topic of interest

4.1.1: Description and Priority
- In this feature, the user will choose a topic of interest, and based on that the program will proceed, this is considered a high priority for the program to work.

4.1.2: Stimulus/Response Sequences
- This functionality will be associated with the customer.

4.1.3: Functional Requirements
- The program will take the topic of interest and start the process of finding the sentiment analysis. The program will connect to twitter servers from here and import the data needed.

Sequence Number: REQ-1

4.2 Software Connect to Twitter server to retrieve and preprocess tweets

4.2.1: Description and Priority
- In this feature, the software will connect to twitter server to retrieve tweets from twitter database, and import it into the data set.

4.2.2: Stimulus/Response Sequences
- This functionality will be associated with the system.

4.2.3: Functional Requirements
- The program will retrieve the tweets from the server, and then it will import it into the software, preprocess the tweets, and then the algorithm will start doing the analysis on the tweets. The next step will be the analysis.

Sequence Number: REQ-2

4.3 Software does nlp and sentiment analysis on tweets

4.3.1: Description and Priority
- In this feature, the software will do the sentiment analysis using the algorithm described in 3.1. The software will analyze the tweets using natural language processing, and will give sentimental analysis.

4.3.2: Stimulus/Response Sequences
- This functionality will be associated with the system.

4.3.3: Functional Requirements
- The program will execute analysis of the tweets, and then based on the findings the software will move to the next system feature, where based on the analysis we will be producing sentiment analysis score.

Sequence Number: REQ-3

4.4 Software produces Sentiment scores

4.4.1: Description and Priority
- In this feature, after the software finishes with the sentiment analysis, we will be using the output to produce the sentiment score. The software will calculate the sentiment score and finalize the results.

4.4.2: Stimulus/Response Sequences
- This functionality will be associated with the system.

4.4.3: Functional Requirements
- The program will return the score, and based on that, the program will move to the last part, in which combining the output produces a report regarding the findings for the user.

Sequence Number: REQ-4

4.5 Software send the customer/user report using the platform or email

4.5.1: Description and Priority
- In this feature, after the calculation of the sentiment score, the system will send the customer a detailed report, regarding the findings.

4.5.2: Stimulus/Response Sequences
- This functionality will be associated with the system and the user.

4.5.3: Functional Requirements
- The program will send a detailed report for the user, in the report the findings will be discussed, and in the last step the system alongside of the report will send the customer also a form to fill to evaluate the services.
- The customer will fill in the report and based on that, the system will have feedback in what ways we will need to improve the program.

Sequence Number: REQ-5

5. Other Nonfunctional Requirements

5.1 Performance Requirements

Regarding how fast our system returns results, our metric will be based on two aspects, which are the rendering of the website in which the user wants sentiment analysis performed (i.e the landing page), as well as the second step which is the software connecting to twitter server, requesting the data and receiving authorization for the retrieval, retrieving tweets from twitter database, and returning a sentiment score. With a predicted scalability of 5000 users per day, we aim to provide 1-3 seconds or less response time in a Chrome desktop or safari browser for the loading of the website, and around 5-7 seconds for retrieving the data from twitter ,authorization, returning a sentiment score, and providing the report.

5.2 Safety Requirements

As opinions on the Web are important for many applications, it is no surprise that people have started to game the system. one example of how this is done is called opinion spam. . Opinion spam refers to fake opinions that try to deliberately mislead readers or automated systems by giving undeserving positive opinions to some target objects in order to promote the objects and/or by giving malicious negative opinions to some other objects in order to damage their reputations. This can lead to providing a sentiment analysis score that is flawed, and therefore, if a user wants a sentiment analysis done on a product/brand that he is interested in, fake undeserving positive opinions can lead to him making a wrong decision. Fake profiles and spreading of fake news can lead to false sentiment analysis which can be misleading and dangerous to the opinions of the general public, this was a huge issue during the 2016 US election campaign when hundreds of websites published falsified or heavily biased stories – many of them in the pursuit of capitalising on social media advertising revenue.

5.3 Security Requirements

In terms of security, the main threat is bots and fake profiles promoting fake news, however that is something that is out of our control and is in the control of twitter and their personal algorithm. As of 2018, the washington post reported that twitter erased 70 million bot accounts in the space of two months following the 2016 U.S presidential election (https://www.washingtonpost.com/technology/2018/07/06/twitter-is-sweeping-out-fake-accounts-like-never-before-putting-user-growth-risk/), and many sources report that although bots still exist, twitter is doing a good job of eradicating them. Additionally, in regards to our loading webpage, we will be implementing general habits to avoid hackers. These include watching out for SQL injection, Protect against XSS attacks, Use HTTPS, and testing our security using website security tools, such as Netsparker and OpenVAS.

5.4 Software Quality Attributes

Seeing as though the software imports the data set that is the last 100-200 tweets from twitter on this topic, the sentiment analysis will always be current and up to date. Regarding the *reliability* of the software, expressed this as a probability and we predict that our system will have a 95 percent reliability for a month given the predicted ceiling of 5000 users a day, this means that during this month, under normal usage conditions, there's an 95 percent chance that the system won't experience critical failur*e.* Moreover, in terms of the *maintainability*, we also used a probability percentage to predict this, and we estimated this number to be around 85 percent. What we mean by this is for example, if you have 85 percent maintainability for 24 hours, this means that there's a 85 percent chance the component can be fixed in 24 hours.

5.5 Business Rules

Sentiment analysis in NLP is about deciphering such sentiment from text, so it is easy to imagine the possible use cases of a software, a possible one is to Discover negative reviews of your product or service on twitter as well as identify which components of your product or service are people complaining about, and tracking changes to customer sentiment over time for a specific product or service to check if things have been getting better. Another possibility is looking at the aggregate sentiment on financial instruments, such as specific stocks. What is the recent market sentiment on stock xyz? Moreover, one can use this for Track shifting opinions of politicians over time, such as individuals or groups such as political parties.

6. Requirements Gathering Report

- **Connect to twitter servers and begin the data mining process**: We surveyed students on campus asking them which platform (Facebook, Instagram, Twitter) they would use to express their own opinions on general world events or even their own personal issues. Our survey results were predominantly Twitter, with some students saying they would even use Twitter to keep up to date with worldwide political issues and events such as campaigns for race and gender justice. Additionally, another reason for choosing twitter as opposed to other social media websites is because Twitter is a gold mine of data. Unlike other social platforms, almost every user's tweets are completely public and pullable. This is a huge plus

if you're trying to get a large amount of data to run analytics on. Twitter data is also pretty specific. Twitter's API allows you to do complex queries like pulling every tweet about a certain topic within the last twenty minutes, or pull a certain user's non-retweeted tweets. Moreover, we extract only the last 100 tweets so that users can get present time sentiment analysis.

- **Returning the score and providing a detailed report:** After deciding that we would use Twitter as our data mining source given our survey results, we then came up with a questionnaire in which we asked students what issues they had with Twitter. According to the results of the questionnaire, students complained that although Twitter is a great source for finding information on a particular subject, students are overwhelmed due to the abundance of opinions. Additionally, students also complained that they find opinions that widely differ, whether that would be a political opinion or a review of a product or service they are interested in purchasing. Upon our analysis of the students' submissions, this led us to our decision to provide a detailed report of a general score to summarize all the opinions on Twitter using Sentiment Analysis. We decided to provide the sentiment analysis metric on a scale of Very Negative, Negative, Neutral, Positive, Very Positive. For example, if a customer says, "this product xyz was fine" vs "this product xyz was terrible", we want to be able to stress the difference between these two statements.